

SMOKING HABITS AND CHANGES IN SMOKING HABITS AS THEY RELATE TO CHRONIC CONDITIONS AND RESPIRATORY SYMPTOMS

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The relation of smoking to chronic lung disease has been documented in several studies. Several conclusions have been drawn about the type of smoking associated with disease, including inhalation, filter tip use, and reduction in smoking. These factors were examined in a community epidemiologic study of chronic obstructive lung diseases. It was found that the community population exhibited greater filter tip use and higher rates of ex-smoking than often seen elsewhere. Smoking habits and the changes in smoking habits over time were related to physician-diagnosed emphysema and/or chronic bronchitis, but not asthma. Some relation was seen also with present heart trouble. There was a dose-relationship to pack-years of smoking in both present and ex-smokers. There were more ex-smokers among males. Most male ex-smokers quit due to symptoms. Ex-smokers were found to have high rates of diagnosed disease but reduced rates of symptoms. The incidence of diagnosed disease was found to be associated with smoking, both in intensity and duration. Changes in smoking over time were found to be correlated with symptomatology.

bronchitis; emphysema; health surveys; heart diseases; lung diseases, obstructive; respiratory tract diseases; smoking

The adverse health effects of smoking have been well-documented (1-3), and the relationships of smoking to respiratory symptoms and diseases have been reviewed (4, 5).

Smoking habits not only differ among individuals, but often change with time in the same subject. In the present report, effects of smoking habits and changes in smoking are reviewed in a general population sample in the Southwest. These characteristics are related to chronic respiratory conditions detected by questionnaire, including relationships to specific diagnoses and to the general presence of physi-

cian-confirmed airways obstructive diseases: emphysema, chronic bronchitis, bronchiectasis, and/or asthma. In addition, this paper examines changes in smoking habits in relation to changes in respiratory symptoms and diagnoses.

MATERIALS AND METHODS

Data in the present report are from a stratified random sample of the Anglo-white, (non-Mexican-American) population of Tucson. Details of selection of this population and of study methods have been reported (6). Briefly, the Tucson Epidemiologic Study of Obstructive Lung Diseases utilizes a multistage stratified sample of Tucson Anglo-white households, which are being followed longitudinally with yearly evaluation. The population under study includes 3487 Anglo-white subjects, 2857 of whom are over age 14 and

are considered port. The indiv one to 96 years bers in all age-se ent socioeconomic ported previous estimates are q

Smoking hab tional Heart ar standard questi- vided into five smokers—those least one cigar ers—those who rette per day i stopped smoking, erage of less th moderate smoke cigarettes per d an average of n day. Ever smok or ex-smokers. fined as light, ers. Since there who smoked pip smoked cigaret are not includ es. The other ined include th tion of smoke, f and similar pip

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Analyses we dard tabular multivariate

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are considered adults in the present report. The individuals range from under one to 96 years of age, with similar numbers in all age-sex groups within the different socioeconomic status strata. As reported previously, the standard errors of estimates are quite low for this study (6).

Smoking habits, derived from the National Heart and Lung Institute (NHLI) standard questionnaire (9), have been divided into five broad categories: 1) never smokers—those who have never smoked at least one cigarette per day, 2) ex-smokers—those who smoked at least one cigarette per day in the past but who have stopped smoking, 3) light smokers—an average of less than 10 cigarettes per day, 4) moderate smokers—an average of 10 to 20 cigarettes per day, and 5) heavy smokers—an average of more than 20 cigarettes per day. Ever smokers are defined as present or ex-smokers. Present smokers are defined as light, moderate, or heavy smokers. Since there are virtually no subjects who smoked pipes or cigars who had never smoked cigarettes, pipe and cigar smoking are not included separately in most analyses. The other smoking variables examined include the amount smoked, inhalation of smoke, filter use, years of smoking, and similar pipe-cigar smoking factors.

Symptoms, diagnoses and in-migration status used herein are also derived from the self-completion questionnaires (9). The symptoms reported are essentially those derived from the NHLI modification of the British Medical Research Council Respiratory Questionnaire. Subjects were also asked if they had "emphysema," "chronic bronchitis," "bronchiectasis," and "asthma," and whether they had seen a physician for the condition (i.e., diagnosed). Subjects reported the presence of symptoms. Family income and occupation are derived from administered questionnaires.

Analyses were performed utilizing standard tabular routines, regressions, and multivariate analyses, such as multiple

regressions. These multivariate methods also include measures of income, education, and migration status. Most analyses are carried out on a CDC 6400 computer using SPSS programs.

RESULTS

Smoking habits. Forty-four per cent of the adult population never smoked, while 33 per cent are present smokers and 23 per cent are ex-smokers. The age and sex distribution by smoking category is shown in figure 1. There are marked differences in smoking habits within the different age groups, and more males than females smoke. In the less than 15 age group, only two 14-year-olds admitted to smoking; these were two females who are light smokers. In the age group 15-17, only 13 of 75 males (17 per cent) and 16 of 67 females (24 per cent) admitted to smoking, and they all smoke a pack or less per day.

Eighty-seven per cent of the present smokers in this study smoke cigarettes with filters and 83 per cent of previous smokers smoked cigarettes with filters. Inhalation of cigarette smoke was admitted by 91 per cent of present smokers and 83 per cent of ex-smokers. Analyses were carried out to compare the filter versus the non-filter cigarette smokers and the inhalers versus non-inhalers, and they show no significant differences in any respect (symptoms, diagnoses, or lung function), possibly due to the small number of non-inhalers and non-filter cigarette smokers. Thus, these factors are not considered further.

There are only eight non-cigarette smokers who use only pipes or cigars in this study. Among cigarette smokers, 4 per cent of the adults are regular pipe or cigar smokers and an additional 7 per cent have smoked pipes or cigars previously. Over 40 per cent of these pipe or cigar smokers claim to have inhaled the pipe or cigar smoke.

Among present cigarette smokers, there is no meaningful difference between "pres-

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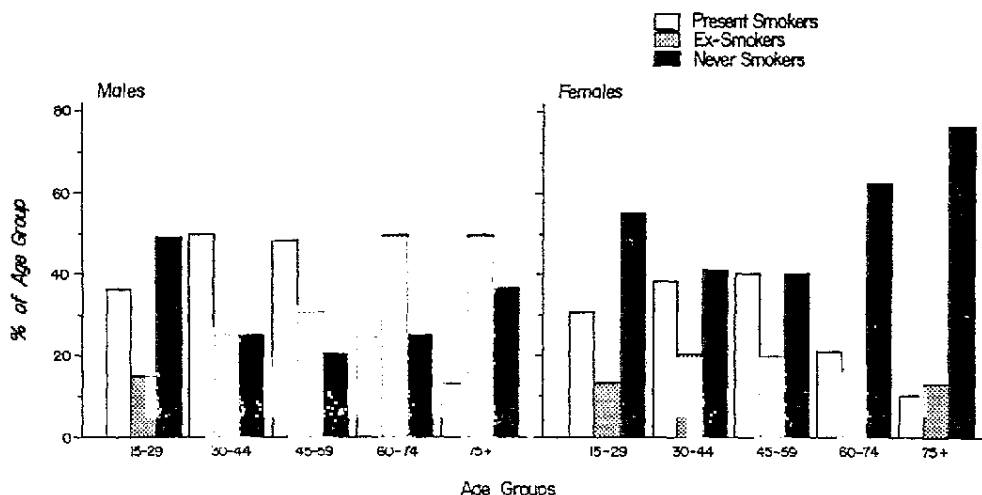


FIGURE 1. Smoking habits by age for males and females over 14 years old.

ent" and "usual" numbers of cigarettes, with 78 per cent giving exactly the same answers and the remainder divided evenly among those who smoked slightly more in the past and those who smoked slightly less in the past (<5 cigarettes per day difference).

Many other factors have been shown to have an important relationship to chronic diseases and respiratory symptoms in this population. These include migration patterns, α_1 -antitrypsin, environmental exposures, and socioeconomic status. Because these factors are not responsible in themselves for effecting any change in the relation of smoking to chronic diseases and symptoms, they are not considered in further analyses.

Smoking habits related to reported diagnoses. Subjects who reported their diagnoses as physician-confirmed differ appreciably from those who reported such diagnoses without physician-confirmation in terms of symptoms and lung function. Thus, only the former are considered. The overall prevalence rates of reported physician-confirmed obstructive lung diseases and present heart trouble among subjects with different smoking histories are shown in table 1. The rate of physician-confirmed

present emphysema is greater in smokers but does not increase with intensity of smoking. This increase is greater in the males than the females, and in the older age groups than younger age groups. The overall prevalence rate of emphysema is 0.6 per cent in the never smokers compared to 4.0 per cent in the heavy smokers, 4.3 per cent in all present smokers and 7.0 per cent in ever smokers. In males age 60 years or older, the rate increases to 12.5 per cent among present smokers and to 21.9 per cent in ever smokers. It will be noted that the rate of reported emphysema is highest in the ex-smoker: 10.9 per cent overall and up to 26 per cent in males age 60 and older.

The overall relationship of smoking to physician-confirmed present chronic bronchitis is different in trend to that seen with emphysema. The overall rate of reported chronic bronchitis is 4.2 per cent for never smokers, and 8.8 per cent for heavy smokers, 7.1 per cent for present smokers, and 8 per cent for ever smokers. Males aged 45 and over show higher rates among the ex- and heavy smokers than do females, but the rates among never smokers are higher in the female groups. Present bronchiectasis confirmed by a physician was seldom

Age- and sex-sp

Emphysema

Males: all

45+

Females: all

45+

Chronic bronchi

Males: all

45+

Females: all

45+

Bronchiectasis

Males: all

45+

Females: all

45+

Asthma

Males: all

15-44

45+

Females: all

15-44

45+

Heart trouble

Males: all

45+

Females: all

45+

Total population

Males: all

45+

Females: all

45+

Age 15+

reported, although as those seen with bronchitis. Physicians' relationship to smoking: "asthma" is often reporting "emphysema/bronchitis."

The trends in

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TABLE 1

Age- and sex-specific prevalence rates (per 100) of physician-confirmed present obstructive lung diseases and present heart trouble in Anglo-white adults* by smoking

		Smoking history				Subtotals	
		Ever				Present	Ever
		Never	Ex	Present			
				Light-mod- erate (20/ day)	Heavy (21 +/day)		
No.		Prevalence rates/100					
Emphysema							
Males: all	90	0.7	15.5	6.7	4.5	5.2	10.0
45 +	88	3.0	21.3	13.7	8.9	11.0	16.9
Females: all	34	0.6	4.1	8.8	3.4	3.4	3.7
45+	31	1.3	6.8	13.6	4.8	5.2	5.8
Chronic bronchitis							
Males: all	77	2.4	9.7	5.9	8.4	6.3	7.9
45+	67	3.6	13.1	10.3	15.2	11.5	12.4
Females: all	103	5.1	8.6	12.5	9.2	7.9	8.1
45+	84	6.9	13.0	15.3	11.1	10.8	11.7
Bronchiectasis							
Males: all	28	0.5	3.8	2.5	1.7	2.0	2.8
45+	26	1.2	5.3	5.1	3.8	4.3	6.3
Females: all	21	1.1	1.5	2.5	0.8	1.1	1.2
45+	16	1.5	2.5	4.3	1.6	1.9	2.2
Asthma							
Males: all	106	5.9	9.7	8.7	3.9	5.0	7.2
15-44	36	7.6	6.3	5.4	2.0	4.0	4.7
45+	51	4.1	11.0	6.8	6.3	6.2	9.0
Females: all	122	6.3	7.5	14.7	6.7	6.3	6.8
15-44	36	3.8	5.7	7.7	8.9	8.2	7.4
45+	66	7.9	8.7	7.5	4.8	4.4	6.1
Heart trouble							
Males: all	132	3.8	16.5	17.6	5.6	8.3	12.1
45+	113	11.2	23.0	40.2	7.6	13.9	19.1
Females: all	188	10.3	12.0	17.4	7.6	8.2	9.6
45+	170	20.5	18.6	30.0	7.9	13.1	15.3
No. of cases							
Total population							
Males: all		420	394	280	178	452	852
45+		250	283	130	79	209	492
Females: all		849	266	352	119	471	737
45+		521	161	188	63	251	412

* Age 15+.

reported, although the trends are the same as those seen for emphysema and chronic bronchitis. Physician-confirmed present asthma does not show a consistent relationship to smoking. In these groups, "asthma" is often reported in subjects also reporting "emphysema" and/or "chronic bronchitis."

The trends in the rates of present heart

trouble by smoking habits, age, and sex are not consistent. Males 45 and older who were present (or ever) smokers had higher rates than never smokers, and the ex-smokers had higher rates than the present smokers.

Unlike other chronic conditions studied, age and sex-adjusted rates of present ulcers are also significantly related to smok-

ing. However, age- and sex-specific rates of present ulcers do not show a consistent relation to smoking habits. Thus, the relation of smoking habits to other chronic conditions is not studied further.

Relative risk ratios comparing smoker to never smoker rates are computed by age and sex for emphysema, chronic bronchitis, bronchiectasis, asthma, and heart trouble (table 2). The ratios are quite high for emphysema, chronic bronchitis in males, all physician-confirmed obstructive lung diseases, and present heart trouble. Physician-confirmed emphysema and chronic bronchitis are seen much more often than expected among the ex-smokers and much less often than expected among the never smokers.

The obstructive lung diseases, specifically emphysema, chronic bronchitis and asthma, are considered individually. It was found that 59 per cent of asthma, 49 per cent of chronic bronchitis, and 43 per cent of emphysema occur alone. These proportions vary by age and sex. When each of these obstructive lung problems is examined separately by smoking categories in different age and sex groups, certain

differences are seen in comparison to the previous analysis (table 3). In all age groups, asthma alone shows no relationship to smoking except for a slight increase among ex-smokers. The relationship of chronic bronchitis alone to smoking is much less striking than for diagnoses of chronic bronchitis where other diseases also are present. Emphysema alone, on the other hand, hardly ever occurs in non-smokers. Emphysema plus chronic bronchitis is much more common among smokers than non-smokers.

The prevalence rates of both physician-confirmed present emphysema and chronic bronchitis are directly related to cigarette pack-years smoked in male present smokers and ex-smokers, age 45 and older (table 4). Pack-years smoked does not appear to be related to physician-confirmed present asthma or to abnormal x-rays in any group. Further age specification does not change the results. Duration and amount of pipe or cigar smoking do not affect the rates.

Onsets of smoking and airways obstructive disease. It is noted that adults reported they started smoking around age

TABLE 2
Reported chronic disease by smoking and sex, ages 45+: Ratios of prevalence rates

	Ever/never	Ex/never	Present/never	Heavy/never
Emphysema				
Males	5.63	7.10	3.67	2.97
Females	4.46	5.23	4.00	3.69
Chronic bronchitis				
Males	3.44	3.63	3.19	4.22
Females	1.00	1.00	1.00	1.60
Bronchiectasis				
Males	5.25	4.42	3.58	3.17
Females	1.47	1.67	1.27	1.07
Asthma				
Males	2.20	2.68	1.51	1.54
Females	0.77	1.10	0.56	0.61
Asthma, emphysema or any kind of bronchial trouble				
Males	2.27	2.70	1.75	1.78
Females	1.38	1.43	1.35	1.58
Heart trouble				
Males	1.71	2.05	1.24	0.68
Females	0.75	0.91	0.64	0.39

TABLE 3
Prevalence rates/100 of reported obstructive lung diseases examined separately by smoking, age, and sex

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3.17
1.07
1.54
0.61
1.58
0.68
0.39

TABLE 3
Prevalence rates/100 of reported obstructive lung diseases examined separately by smoking, age, and sex

		Total	Never smoked	Ex- smoker	Present smoker			Total ever smokers	Relative risk ratios				
					Light- moderate	Heavy	Total		Ever/ never	Ex/never	Present/ never	Heavy/ never	
Chronic bronchitis alone													
Males	No.	19	4	5	5	5	10	15					
	%	1.5	1.0	1.3	2.8	2.8	2.2	1.8	1.85	1.34	2.29	2.96	
Females	No.	63	27	13	19	4	23	36					
	%	4.0	3.2	4.9	5.4	3.4	4.9	4.9	1.53	1.54	1.53	1.06	
All age 45+	No.	62	22	16	17	7	24	40					
	%	3.9	3.2	3.6	5.3	4.9	5.2	4.4	1.39	1.13	1.64	1.55	
Total†	No.	82	31	18	24	9	33	51					
	%	2.9	2.4	2.7	3.8	3.0	3.6	3.2	1.32	1.12	1.45	1.24	
Emphysema alone													
Males (45+)	No.	39	1	27	10	1	11	38					
	%	5.9	0.6	6.87	7.7	1.3	5.3	10.1	16.75	11.45	8.83	2.17	
Females (45+)	No.	13		7	6		6	13					
	%	1.39		4.35	3.19		2.39	3.16					
Total†	No.	53	1	34	17	1	18	52					
	%	1.9	0.1	5.2	2.7	0.3	1.9	3.3	40.88	64.5	24.25	4.25	
Both emphysema and chronic bronchitis*													
Males	No.	18	2	10	2	4	6	16					
	%	1.4	0.5	2.5	0.7	2.3	1.3	1.9	3.92	5.29	2.73	4.69	
Females	No.	6	1		1	4	5	5					
	%	0.6	0.1		0.1	0.4	0.5	0.5					
All age 45+	No.	22	3	10	13	6	19	29					
	%	1.4	0.4	2.3	0.9	4.2	2.0	2.1	4.88	5.26	4.56	9.84	
Total†	No.	24	3	10	3	8	11	21					
	%	0.8	0.2	1.5	0.5	2.7	1.2	1.3	5.50	6.33	4.92	11.21	
Asthma alone													
Total†	No.	111	58	21	25	7	32	53					
	%	3.9	4.6	3.2	3.9	2.4	3.4	3.3	.73	.70	.75	.52	

* Together but without asthma or bronchiectasis.

† Total: total population ages 15+.

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TABLE 4

Sex-specific prevalence rates (per 100) of reported history and diagnoses by pack-years of smoking in males 45 and older, present and ex-smokers

Pack-years (p-y)	MD-confirmed present illnesses			Abnormal chest x-ray	No.
	Emphysema	Chronic bronchitis	Asthma		
Present smokers					
Total	11.0	11.5	6.2	16.3	208
1-30 p-y	4.1		4.1	8.2	49
31-45 p-y	14.3	11.1	7.9	14.3	63
46-60 p-y	14.5	20.0	5.5	14.5	55
Ex-smokers					
Total	21.2	13.3	11.2	20.9	278
1-30 p-y	11.2	9.6	10.4	21.6	125
31-60 p-y	26.4	14.3	9.9	18.7	91
61+ p-y	33.9	19.4	14.5	22.6	62

16, on the average. Some present adult smokers started smoking prior to the age of 15; 16.4 per cent appear to have started under the age of 14, and 54.2 per cent started between the ages of 15 and 19.

Approximately one-third of present smokers with emphysema and/or chronic bronchitis had their onset of disease prior to the onset of smoking, one-third within the first 20 years of smoking, and one-third after 20 or more years of smoking. In males, there is a higher percentage of disease onset after 20 years of smoking (43.7 per cent); in females, this rate is slightly less (24 per cent).

Examining correlations between age of disease onset and age of smoking onset, one finds no significant correlations in males or in females. In male and female ex-smokers, when one accounts for age, there is no significant correlation of age of disease onset with age of quitting smoking, or number of years smoked.

Ex-smokers. Many ex-smokers stopped smoking because of cough, wheeze, or shortness of breath and these ex-smokers differ from other ex-smokers. Males twice as often said they quit because of symptoms than did females, and older individuals quit more often because of symptoms. Inhalation occurred more among these ex-smokers. Males over 44 years of age who quit for health reasons had significantly

higher proportions of inhalers and long-term smokers.

Those who quit for health reasons generally have higher rates of persistent cough, persistent phlegm, exertional dyspnea, wheeze on most days, attacks of wheezing dyspnea, and a higher rate of physician-confirmed asthma, bronchial trouble, or emphysema. These differences are also seen in the individual age and sex subgroups (table 5). Ex-smokers have a larger, but not significantly larger, rate of pipe or cigar smoking, compared to present smokers. Among the male ex-smokers, 17.3 per cent are present pipe or cigar smokers. Present pipe and cigar smokers who are ex-cigarette smokers had very similar reasons for quitting, and their rates of diagnosed respiratory disease, heart disease, and respiratory symptoms are equivalent to other ex-smokers. Most ex-smokers quit smoking approximately 20 years after they started (a mean age at quitting of 39.8 ± 16.7 , and a median of 39.6). There is no significant difference in age of smoking onset or age of cessation between those with obstructive lung diseases and those without.

Longitudinal changes in smoking habits and related changes in symptoms and diagnoses. Follow-up questionnaires were obtained at least twice on 96 per cent of the adults, with an average interval

Prevalence

Quit for health reasons*

Males

15-44

Yes

No

45+

Yes

No

Females

15-44

Yes

No

45+

Yes

No

* Cough, wheeze, or

† χ^2 : s, significant

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TABLE 5

Prevalence rates of reported symptoms and diagnoses among ex-smokers by reasons for quitting, by age and sex

Quit for health reasons*	Wheeze most days	Attacks of shortness of breath with wheeze	Exertional shortness of breath, Gr. 3+	MD-confirmed asthma, bronchial trouble, emphysema	Persistent cough	Persistent phlegm	No.
Males							
15-44							
Yes	10.0	33.3	6.7	46.7	13.3	23.2	30
No		13.6	1.2	22.2	6.2	8.6	81
	s†			s			
45+							
Yes	26.3	49.1	44.8	59.6	43.9	46.5	114
No	9.6	19.0	14.9	23.8	17.3	19.0	168
	s	s	s	s	s	s	
Females							
15-44							
Yes	9.6	38.1	19.0	28.6	28.0	19.0	21
No	1.2	13.1	7.2	23.8	4.8	4.8	84
	s	s	sb	sb	s	sb	
45+							
Yes	10.8	29.7	35.1	37.8	27.0	18.9	37
No	4.1	21.1	19.5	30.1	12.2	13.0	123
	s		s		sb		

* Cough, wheeze or shortness of breath.

† χ^2 : s, significant; sb, borderline significant ($.05 < p < .10$).

between initial and third exam of two and one-half years. In that time period, 206 new cases of physician-confirmed obstructive lung disease were reported. There are slightly more heavy smokers and ex-smokers in the new cases (1.8 and 4.6 per cent, respectively) than in the non-disease subjects, but these minor differences were neither significant nor related to symptoms. Though the differences are not significant within specific age-sex groups, there is a consistently higher proportion of long-term disease cases among ever smokers than among never smokers. Accordingly, there are consistently more healthy subjects among never smokers than ever smokers (table 6).

There is a 3.6 per cent rate of smoking cessation and a 2 per cent rate of smoking onset in the adults during that interval. Those who ceased smoking went from more cough or phlegm to less, and those

who started smoking have a 22 per cent rate of new cough, including new chronic cough, and about a 10 per cent rate of new phlegm. Those who continued smoking and those who started smoking in the interval have equivalently higher rates of chronic cough and chronic phlegm than the others. Present smokers still have a higher rate of phlegm or cough alone than ex- or never smokers, as previously reported (7). Among the ex-smokers, the loss rate of cough of any kind is 16 per cent, while the loss rate of chronic cough is 8.6 per cent. The reversion rate from phlegm or chronic phlegm to no phlegm is 11.1 per cent in this group of ex-smokers.

New smokers and new ex-smokers do not show either acquisition or loss of wheeze, or attacks of wheezing dyspnea. Thus, change in smoking habits is almost entirely associated with changes in cough or phlegm production.

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TABLE 6
Percentage of smokers who are old, new, or never
cases of obstructive lung diseases, by age and sex

Disease*	Smoking		Total	Z proportion†
	Present	Never		
Male				
15-44				
Old	19.8	17.1	18.6	ns
New	4.1	12.4	8.0	ns
None	69.4	63.7	66.7	ns
(n)	(222)	(193)	(415)	
45+				
Old	30.8	16.4	27.3	ns
New	9.5	9.8	9.6	ns
None	54.5	68.9	58.0	s
(n)	(380)	(122)	(502)	
Female				
15-44				
Old	25.2	18.3	21.7	ns
New	12.6	8.3	10.4	ns
None	55.9	67.8	61.9	s
(n)	(222)	(230)	(452)	
45+				
Old	30.3	22.1	25.5	ns
New	10.5	9.1	9.7	ns
None	54.1	63.7	59.7	s
(n)	(314)	(430)	(744)	
Total				
Old	27.4	19.4	23.7	s
New	9.3	9.6	9.4	ns
None	57.6	65.4	61.2	s
(n)	(1139)	(981)	(2120)	

* Excludes suspect cases (reported some previous disease, but no longer do), 5.7 per cent of total.

† Two-tailed test of differences between proportions (Z statistic). s, significant, $p < .05$; ns, not significant.

DISCUSSION AND CONCLUSIONS

The relationship of smoking to airways obstructive disease found herein is similar to that noted by other investigators. The relationship of smoking to the diagnosis of emphysema is quite clear. Surprisingly, physician-confirmed chronic bronchitis without emphysema is less closely related to smoking, despite the close relationship of smoking to productive cough. As previously reported (7), clinically diagnosed chronic bronchitis was not identical to bronchitis as determined solely by history of chronic productive cough, as shown by a standard survey questionnaire. As previ-

ously hypothesized, there was a lack of relationship of smoking to asthma diagnoses, when the set of diagnoses of emphysema, chronic bronchitis, and bronchiectasis were excluded. We have shown, however, that a relationship of asthma to smoking can be demonstrated when skin test reactivity is taken into account (11), with the effect limited to subjects who have no positive skin test reactions.

Prevalence rates of disease in our group of never smokers still appear to be at least as high and often higher than the rates reported by other studies of non-smokers (10). Furthermore, the proportion smoking in the study population does not appear to be the factor responsible for the very high overall prevalence rates noted in this Tucson population. This population differs from others in that more people in the Tucson study use filter-tip cigarettes and admit to inhaling, while fewer have smoked only pipes or cigars than noted in other study groups (1-3, 12). Since ours is a recent study, this may reflect changes in smoking habits in general populations over time. The relation of filter use and inhalation to symptom rates in this study as compared to the study by Comstock et al. (12), may be a function of the changes in habits and the small number of non-filter users and non-inhalers. Greater use of filter cigarettes also has been hypothesized, and there is reason to believe that there may be a shift toward filter cigarettes with lower tar and nicotine content. This will have to be examined further.

Another difference in this population is the smaller proportion of present, ex-, and never smokers who smoke pipes and/or cigars. The pipe-cigar use in each of the three groups was either so small, or had so little additional effect, that no relationship was seen between pipe and/or cigar smoking and either symptoms or reported disease.

It was interesting to note that there was a lack of any correlation between age at onset of smoking and onset of disease. This

aspect of our prev with longitudinal pothesized that on to onset of disease and intensity (pack cause the possible of symptoms and years of smoking a chosen to report the

In the multivar and education vari towards an explan disease rates. The disease was the sar tus groups, even th is related to disea

Symptom inform questionnaire, has smoking as reported 7, 12), than does r ways obstructive d flect a different st reflects physician o ject perception and is little reason to b valid than the other In fact, physician-cc lates better with lur ties than any symp ports of physician- lung diseases are a symptom informatic physicians' terms fo jects' identification c ambiguous and pro lapping. The relatic nesses to subjects' rep

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aspect of our prevalence data may alter with longitudinal study. It has been hypothesized that onset of smoking is related to onset of disease as a function of duration and intensity (pack-years of smoking). Because the possible dose-response relations of symptoms and lung function to pack-years of smoking are so complex, we have chosen to report these analyses separately.

In the multivariate analyses, income and education variables contributed little towards an explanation of the variation in disease rates. The relation of smoking to disease was the same in all migration status groups, even though migration status is related to disease (13).

Symptom information, from the same questionnaire, has a different relation to smoking as reported by us and others (4, 5, 7, 12), than does reported diagnosed airways obstructive disease, which may reflect a different stage of disease. It also reflects physician opinion as well as subject perception and memory, though there is little reason to believe that one is less valid than the other as a disease indicator. In fact, physician-confirmed disease correlates better with lung function abnormalities than any symptom or syndrome. Reports of physician-confirmed obstructive lung diseases are also more reliable than symptom information (14). It is likely that physicians' terms for disease (and the subjects' identification of them) are somewhat ambiguous and probably therefore overlapping. The relation of physicians' diagnoses to subjects' reports of symptoms will

be examined in further studies of this population.

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